As aluminium alloy become more popular in the building industry (Miller et al. 2000; Roy et al. 2021; International Aluminium Institute 2011), the uses of such back-to-back consecutive built-up sections as the primarily load bearing column members are increasing. This paper study considered presents the axial strength of such these sections and 12 new experimental-empirical tests and 246 finite element (FE) analysis results are presented. Fig. 1 shows presents the details of the built-up columns investigated studied in this work. An image photograph of the built-up section prior to compression test is shown in Fig. 2, where the general arrangement of the intermediate screw fasteners between the back-to-back channels are shown.

The Aluminium Design Manual (ADM 2020) and Eurocode 9 (CEN 2007) both provide recommendations for designing the aluminium alloy single channel section columns under axial load. However, on the other hand, they do not include comprise recommendations for such back-to-back consecutive built-up aluminium alloy channel sections. The American Iron and Steel Institute (i.e., AISI 2016) and the Australian and New Zealand Standards (i.e., AS/NZS 2018) both recommend the same modified slenderness approach technique to take into account the spacing of the screws in the built-up columns. However, this approach is for cold-formed steel (CFS) members instead of aluminium alloy members. In the existing body of literature, no papers studies have been reported addressing this issue.

For the cold-formed type of carbon steel, back-to-back columns, research on studies are available has been reported. Ting et al. (2018a, 2018b) investigated studied the effect impact of screw-spacing on the axial strength of the back-to-back consecutive built-up CFS channel sections, as shown in Fig. 3. Roy et al. (2018a, 2018b) investigated studied the effect impact of a gap (Fig. 4). Crisan et al. (2014) presented reported the results of numerical models, model results, whereby the sections were built constructed up through via battens. Rondal and Niazi (1990) described reported laboratory tests results for built-up or constructed CFS columns that are connected with spacers. A work by Dabon et al. (2015a, 2015b) studied investigated the behaviour and design of CFS battened built-up or constructed columns. Beside this a recent work by, Roy et al. (2018c), investigated the effect impact of such celebration, that AISI 2016, AS/NZS 2018 and AISI 2016 can be rather un-conservative for in terms of built-up columns, whereby failure is through local buckling. Finally, Kesawan et al. (2017) presented investigated an experimental investigation on the structural performance by utilizing using hollow flange I-section columns.

At the same time, stainless steel built-up columns are also increasingly becoming increasingly popular, they are generally aesthetic, possess have good corrosion resistance and are therefore thus easy to install, maintain, and The area it is also convenient for in terms of construction assembly and construction. (Young and Hartono 2002). Standards The standards that are associated with stainless steel built-up columns include comprise AISI 2016, AS/NZS 2001, AISI 2016 and as well as ASCE 2002, it is should be worthy to note that the design guidance is not specific to the associated with grade. In terms of recent studies, Yuan et al. (2014) presented demonstrated the result of experimental tests results on stainless steel back-to-back consecutive built-up sections under with axial compression. Roy et al. (2018a, 2019b, 2019c, 2019d) and Dobric et al. (2018a, 2018b) have considered investigated the behaviour of different various cross-sections under with axial compression. Finally, Kechidi et al. (2017, 2020) investigated studied the screws spacings and as well as their effect impact on axial strength.

As previously mentioned previously, however, far in terms of the aluminium alloy single channel section sections type columns, research reported in the literature is limited buckling. Feng et al. (2015, 2015, 2016, 2017) and Chen et al. (2017, 2018) investigated the effect of perforations on such single channel section used as columns; these included columns, square shaped hollow section members, circular shaped hollow section tubes, and as well as square and rectangular shaped sections. From this work it was found that recent recent rules for design rules (CEN 2007) were not inappropriate for determining checking their strength under compression. Furthermore, Huynh et al. (2016a, 2016b, 2020) conducted...
carried out experiments to study the buckling behaviour of the aluminium alloy channel sections. In the case of aluminium alloy angle sections, Mazzolani et al. (2000, 2011) investigated the effects of the width-to-thickness ratio, and as well as the occurrence of local buckling for these sections under various axial compression levels. Su et al. (2013, 2014, 2016) has developed a Continuous Strength Method (CSM) to study the overall compression resistance of the aluminium alloy column members.

In this paper, the results of 12 novel experimental tests were reported for back-to-back consecutive built-up aluminium alloy channel sections under various compression levels. Geometric imperfections were measured using a laser scanner, the geometric imperfections were measured. The material properties characteristics of the aluminium alloy were determined through via tensile coupon tests. Assessments taken from of the channel sections. A nonlinear elasto-plastic FE model structure was described and the empirical results were validated against the experimental results. A parametric study investigation comparing with 234 new novel results was undertaken to investigate the effect of the following parameters: hole spacing, modified slenderness, hole spacing, and section thickness. Finally, the experimental and numerical results were used to assess the overall performance of the design, namely, including CEN 2007, ADM 2020, CEN 2007 and AISI 2016-8, as well as AS/NZS 2018.